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EXAMINER	
ZERVIGON, R	
ART UNIT	PAPER NUMBER

1763

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Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

# Office Action Summary

Application No.  
09/414,520

Applicant(s)  
Takahashi et al

Examiner  
Rudy Zervigon

Art Unit  
1763



- The MAILING DATE of this communication appears on the cover sheet with the correspondence address -

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

1) ☒ Responsive to communication(s) filed on Jun 1, 2001

2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 35 C.D. 11; 453 O.G. 213.

## Disposition of Claims

4) ☒ Claim(s) 1, 2, 4-7, 9, and 10 is/are pending in the application.

4a) Of the above, claim(s) \_\_\_\_\_ is/are withdrawn from consideration.

5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.

6) ☒ Claim(s) 1, 2, 4-7, 9, and 10 is/are rejected.

7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.

8) ☐ Claims \_\_\_\_\_ are subject to restriction and/or election requirements.

## Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are objected to by the Examiner.

11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved.

12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. § 119

13) ☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

a) ☒ All b) ☐ Some\* c) ☐ None of:

1. ☒ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

## Attachment(s)

15) ☐ Notice of References Cited (PTO-892)

18) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_

16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

19) ☐ Notice of Informal Patent Application (PTO-152)

17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). \_\_\_\_\_

20) ☐ Other: \_\_\_\_\_

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**DETAILED ACTION**

***Claim Rejections - 35 USC § 112***

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 2 and 7 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. "Temperature" does not have units of energy as eV.

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***Claim Rejections - 35 USC § 103***

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
5. Claims 1, 2, 4, 5, 6, 7, 9, 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Satou et al (U.S.Pat. 5,961,850) in view of H. Nishino et al. Satou et al describes:
  - i. a plasma processing apparatus (Figure 1, column 2, lines 32-58) having a vacuum processing chamber (Figure 1, item 10, column 3, lines 10-15)
  - ii. a sample table (Figure 1, item 11, column 2, lines 32-58) for mounting the sample (Figure 1, item 13, column 2, lines 32-58) which is processed in the vacuum processing chamber (Figure 1, item 10, column 3, lines 10-15)
  - iii. a plasma generation means (Figure 1, column 2, lines 45-52), wherein a plasma processing (column 2, lines 59-67) is carried out by generating a plasma in response to introduction of a gas (column 2, lines 59-62) which generates a plasma in which the degree of plasma dissociation is a "middle" degree
  - iv. A temperature of a region (items 36, 37; column 2, lines 52-58) which forms a side wall of the vacuum processing chamber (Figure 1, item 10, column 3, lines 10-15) is controlled to have a range of 10 °C to 120 °C (column 3, lines 10-21)
  - v. electron "temperatures" are affixed under corresponding energies as per the Boltzman relationship:  $E = (2/3)kT$
  - vi. plasma generation means (Figure 1, column 2, lines 47-51)

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- vii. A plasma processing (column 2, lines 59-67) apparatus (Figure 1, column 2, lines 32-58) wherein in the plasma generation means (Figure 1, column 2, lines 45-52) includes a drive of a plasma exciting power supply carried out intermittently ("frequency" of item 12 and the microwave power application means - column 2, lines 39-48)
- viii. A plasma processing (column 2, lines 59-67) apparatus (Figure 1, column 2, lines 32-58) wherein as a means for adjusting a temperature of the vacuum wall, a temperature adjusted coolant (column 3, lines 22-23) medium is used.

Satou et al does not specifically describe:

- ix. A gas which contains at least carbon and fluorine and a gas species is generated which contains carbon and fluorine according to a plasma dissociation
- x. plasma generation means which generates a plasma in which the degree of plasma dissociation is a "middle" degree and the gas species containing carbon and fluorine is generated fully in the plasma

H. Nishino et al demonstrate:

- xi. A gas which contains at least carbon and fluorine (" $\text{CF}_4$ ", Sections II & III.A), and a gas species is generated which contains carbon and fluorine according to a plasma dissociation
- xii. the plasma processing apparatus (Figure 1) comprising plasma generation means (Figure 1, 2.45GHz microwave) which generates a plasma in which the degree of plasma dissociation is a "middle" degree and the gas species containing carbon and fluorine ("RIE", Section III.A) is generated fully in the plasma

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It would have been obvious to one of ordinary skill in the art at the time the invention was made to implement H. Nishino et al's fluoromethane ("CF<sub>4</sub>", Sections II & III.A) as Satou et al's "etchant" gas (column 2, lines 59-62).

Motivation for implementing H. Nishino et al's fluoromethane ("CF<sub>4</sub>", Sections II & III.A) as Satou et al's "etchant" gas (column 2, lines 59-62) is drawn from common industrial practices, and more specifically, as discussed by H. Nishino et al, the gas can be used when "rough Si surfaces can be smoothed and Si trench corners can be rounded off ..." (abstract).

Satou et al does not describe the precise frequency of microwave application as being between 300MHz and 1GHz. H. Nishino et al describes a microwave plasma apparatus with 2.45GHz microwave (Section II.)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to reduce the microwave frequency power application, as taught by H. Nishino et al, in order to impart the desired extent of dissociation.

Motivation for reducing the microwave frequency power application, as taught by H. Nishino et al, is to impart the desired extent of dissociation.

The following results may support the rejection:

6.MPEP 2144.05

OPTIMIZATION WITHIN PRIOR ART CONDITIONS OR THROUGH ROUTINE  
EXPERIMENTATION

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Generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller , 220 F.2d 454, 105 USPQ 233, 235 (CCPA 1955) (Claimed process which was performed at a temperature between 40 \_ C and 80 \_ C and an acid concentration between 25 and 70% was held to be prima facie obvious over a reference process which differed from the claims only in that the reference process was performed at a temperature of 100 \_ C and an acid concentration of 10%). See also In re Hoeschele , 406 F.2d 1403, 160 USPQ 809 (CCPA 1969) (Claimed elastomeric polyurethanes which fell within the broad scope of the references were held to be unpatentable thereover because, among other reasons, there was no evidence of the criticality of the claimed ranges of molecular weight or molar proportions.). For more recent cases applying this principle, see Merck & Co. Inc . v. Biocraft Laboratories Inc. , 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied , 493 U.S. 975 (1989), and In re Kulling , 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990).

Additionally, the Examiner takes official notice on the contention that changing the microwave dissociation frequency would not be obvious to those of ordinary skill in the art -

2144.03      Reliance on Common Knowledge in the Art or "Well Known" Prior Art [R - 1]

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>The rationale supporting an obviousness rejection may be based on common knowledge in the art or "well - known" prior art. The examiner may take official notice of facts outside of the record which are capable of instant and unquestionable demonstration as being "well - known" in the art. In re Ahlert , 424 F.2d 1088, 165 USPQ 418, 420 (CCPA 1970) (Board properly took judicial notice that "it is common practice to postheat a weld after the welding operation is completed" and that "it is old to adjust the intensity of a flame in accordance with the heat requirements."). See also In re Seifreid , 407 F.2d 897, 160 USPQ 804 (CCPA 1969) (Examiner's statement that polyethylene terephthalate films are commonly known to be shrinkable is a statement of common knowledge in the art, supported by the references of record.).



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***Response to Arguments***

7. Applicant's arguments filed June 1, 2001 have been fully considered but they are not persuasive.

8. With regards to applicant's belief that the preliminary amendment filed March 23, 2000 was "overlooked", applicant is referred to the specific, word-by-word, correspondence between the *claim language* of the preliminary amendment filed March 23, 2000 and the rejections in this Office Action *and* the Office Action of February 26, 2001. No amendments, including the present, are "overlooked". All amendments of record are entered.

9. With regards to the claim 2 and claim 7 rejection under 35 U.S.C. 112 second paragraph, the Examiner maintains the rejection. Applicant is suggested to change "temperature" to "energy" is applicant decides to maintain the eV unit which expresses energy *not* temperature.

10. Claim rejections of claims 1-10 under 35 U.S.C. 112 second paragraph are withdrawn in light of the amendment filed June 1, 2001.

11. The position that apparatus claims 1, 2, 4, and 5 are distinguished from the prior art because the apparatus of the prior art does not teach "a gas species is generated which contains carbon and fluorine according to a plasma dissociation" is not convincing. It has been held that apparatus claims must distinguish from the prior art in terms of structure rather than processing conditions. Refer to MPEP 2114. In this case, processing conditions such as the particular gas used does not distinguish the apparatus claims so long as the apparatus is capable of forming a plasma as does the apparatus described by Satou et al (U.S.Pat. 5,961,850) as conveyed in this and the prior Office Actions.

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12. The position that method claims 6, 7, 9, and 10 are distinguished from the prior art because the method of the prior art does not teach "a gas species is generated which contains carbon and fluorine according to a plasma dissociation" is also not convincing. Although Satou et al (U.S.Pat. 5,961,850) does not teach a carbon and fluorine containing plasma, that H. Nishino et al does teach a carbon and fluorine containing plasma and provides motivation for such species, the question of obviousness to those of ordinary skill in the art is established prima face. Accordingly -

Motivation for implementing H. Nishino et al's fluoromethane ("CF<sub>4</sub>", Sections II & III.A) as Satou et al's "etchant" gas (column 2, lines 59-62) is drawn from common industrial practices, and more specifically, as discussed by H. Nishino et al, the gas can be used when "rough Si surfaces can be smoothed and Si trench corners can be rounded off ..." (abstract) .

13. That "the degree of plasma dissociation" is a feature that distinguishes the present application from the prior art is not convincing. This argument is addressed above in paragraph 12 with regards to apparatus claims 1, 2, 4, and 5. With regards to method claims 6, 7, 9, and 10 that "the degree of plasma dissociation" is a feature that distinguishes the present application from the prior art is not convincing. The extent of plasma dissociation or ionization is characterized by, for example, Satou et al where a gas flow controller would influence the extent of the ionized plasma (column 4, lines 34-36) - with a constant energy applied to the plasma at constant temperature, the introduction of unionized process gas via the gas flow controller would reduce the overall extent of ionization as is known to those of ordinary skill in the art.

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14. That "a side wall of the vacuum processing chamber is controlled to have a range of 10°C to 120°C is precisely met by Satou et al for the specific reason of limiting/controlling/"preventing" chamber wall deposits as desired by applicants (column 3, lines 44-51).

15. With respect to the position that Satou et al does not teach or suggest "cooling the side walls of the reaction chamber", applicant is directed to the portion of the Satou et al reference teaching this very concept - column 3, lines 44-51.

16. With regards to the non - "incidental overlap" of the ranges of 10°C < reactor wall temperature < 100°C, such an extension outside the range taught by Satou et al would have been obvious to those of ordinary skill in the art. Refer to MPEP 2144.05. In this case, differences in temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such temperature is critical.

17. With regards to the "opposite purposes" of the Satou et al reference and the present application - lines 4-6 of page 9 of the present amendment asserts that the present invention "serves to limit the amount of gas discharged from the reaction products that become deposited on the side wall.". It is contended, then, that no "opposite purpose" is served by the Satou et al reference. The Satou et al reference serves an identical purpose as supported by the specification of the present application (pages 9-11).

18. H. Nishino et al precisely teach the usage of process gasses that provide carbon and fluorine a plasma gas species ("CF<sub>x</sub>" - Section III.A).

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19. H. Nishino et al precisely relates to the etching, via RIE, of "silicon oxide" (see section I, second and third paragraphs) wherein gas species such as CF and CF<sub>2</sub> are desirable ("CF<sub>x</sub>" - Section III.A) and provides motivation for the presence of "CF<sub>x</sub>" where etch rates of the substrate are controlled (see Section III.A).

***Conclusion***

20. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

21. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (703) 305-1351. The examiner can normally be reached on a Monday through Thursday schedule from 8am through 7pm. The official after final fax phone number for the 1763 art unit is (703) 305-3599. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the

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Chemical and Materials Engineering art unit receptionist at (703) 308-0661. If the examiner can not be reached please contact the examiner's supervisor, Gregory L. Mills, at (703) 308-1633.

  
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